

NASA TECH BRIEF

Marshall Space Flight Center



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Prototype Ultrasonic Instrument for Quantitative Testing

The problem:

Ultrasonic technology has great and largely unused potential for evaluating small discontinuities in solid materials. For example, many individual operators perform weld evaluations satisfactorily for a particular application; but when several of them evaluate the same specimen, different results are generally obtained. Obviously, uniformly calibrated ultrasonic instruments are not being used. Furthermore, the basic characteristics of the instruments differ. These facts contribute to the mistrust many people have of ultrasonic technology and consequently many designers do not specify use of the method.

The solution:

An ultrasonic instrument was developed to be used in quantitative nondestructive evaluation of material defects. The instrument is provided with standard pulse source and transducer for each frequency range selected and includes integral aids that allow calibration to prescribed standards.

How it's done:

The instrument consists of a special pulser/receiver that plugs into a standard oscilloscope, a special RF power amplifier, a standard decade oscillator, and a set of broadband transducers for typical use at 1, 2, 5 and 10 MHz. In addition, the system provides for its own calibration and presents a quantitative indication of time base and sensitivity scale factors and some measurement data on the oscilloscope. Performance includes a velocimetry capability of better than 0.1 percent.

The general features of the system include the specified integral aids to calibration of a high gain broad-

band receiver, a means of adjusting the receiver gain in discrete steps, and mechanical vernier adjustments to calibrate the steps in receiver gain. A standard high frequency source is used to generate pulses of known width and amplitude with a means of adjusting the transmitted pulse width and pulse repetition rate in steps of known magnitude. Other features include mechanical vernier adjustments to calibrate pulse characteristics, methods of adjusting the output voltage of the transmitter continuously over a specified range, and provision for a voltage indicator for transmitter output.

Notes:

1. The information concerning this instrument may be useful to industry in detecting material cracks, voids, inclusions, and unbonds.
2. Requests for further information may be directed to:
Technology Utilization Officer
Marshall Space Flight Center
Code A&PS-TU
Marshall Space Flight Center, Alabama 35812
Reference: B73-10051

Patent status:

NASA has decided not to apply for a patent.

Source: L. C. Lynworth, J. L. Dubois, and
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